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Kara: Home Energy Assistant

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Abstract

Machines are the basic necessity of humankind as they reduce effort and time. But every machine needs energy to run and give output. They require energy in the form of electricity. India lacks in fulfilling the overall demand due to losses of electrical energy. One of the major issues in this is wastage of electricity in homes due to carelessness and laziness of individuals. KARA is a home assistant which can do all the stuffs of a personal assistance including weather reports, reading out the news, playing music, sports up-dates and many more, but what makes it different is its sensitivity towards electricity consumption and production in a house and how to reduce the same. It reads the consumption and production of electricity and provides a report for the user and compares it with previous reports. It also has the feature of receiving verbal commands to turn ON/OFF the appliances by the user when they are nearby or over the internet, when they a rent around. KARA can just sit on top of a table in our homes and can perform the tedious task of keeping track of energy usage in our homes.

Keywords: *Home Energy, audit, solar power.*

Introduction

India is a developing country with a huge need of power resource. And current scenario of power demand is going to increase day by day and production of power is less as compared to demand of electric power. There is a huge wastage of electricity in homes and offices. Several studies show that buildings consuming more than 40 percent of the energy consumption in the country have operational wastage of about 20 percent. That's a lot of juice going down the drain, especially when you consider that some villages in India do not have power. Data from various power exchanges show a higher wastage in 2013-2014 at 5.3 billion units, for roughly 50-60days.

Problem Statement

Most of the electrical energy that is being supplied to our home and offices is produced using non-renewable resources like coal, petroleum etc. Since, fossil fuels are exhausting very fast, so there will be nothing left for future generation to use. Therefore, it is critical for us to take an initiative towards conserving energy and conserving wastage of energy. Now-a-days people can generate power at their home using solar panels (solar power). Solar Power is a renewable source of energy. People can use their own produced power. We need to reduce the wastage of electricity in homes and offices.

Problem Statement

The main objective of our project is saving electrical energy. So, we have built a smart energy assistant named Kara. It monitors the day-to-day energy consumption. User can check the power consumed by the appliances through web pages and can also control the appliances through voice commands. If the user has some energy production in house, he/she can check the units of energy produced per day and month. Real time voltage and current produced/consumed graphs are shown to the user. The smart energy assistant KARA gives energy reports to the user. Kara is the trigger word for the energy assistant. An energy assistant can perform the entire basic personal assistant task and also can monitor our day to day energy consumption and production, if any. By just one touch in respective website we can automate or control all the appliances. Energy Assistant can also control appliances.

Proposed Solution

The main objective of our project is saving electrical energy. So, we have built a smart energy assistant named Kara. It monitors the day-to-day energy consumption. User can check the power consumed by the appliances through web pages and can also control the appliances through voice commands. If the user has some energy production in house, he/she can check the units of energy produced per day and month. Real time voltage and current produced/consumed graphs are shown to the user. The smart energy assistant KARA gives energy reports to the user. Kara is the trigger word for the energy assistant. An energy assistant can perform the entire basic personal assistant task and also can monitor our day to day energy consumption and production, if any. By just one touch in respective website we can automate or control all the appliances. Energy Assistant can also control appliances through voice commands. And user can get all information about energy reports either by using voice commands or visiting a webpage.

The Server

The big idea behind MobileNets is the use of depth wise separable convolutions to build light-weight deep neural networks. A regular convolutional layer applies a convo, the server is the core of our system. It handles all the data from all the webpages as well as hardware devices. The backend is a MySQL relational server based on a Node Js middleware. The server uses Express Js for routing purposes. For all the defined routes, the server handles the queries and provides the required responses.

Each Kara device consists of its own server along with the database, all the pages served through the Assistant device

Are accessible only via the registered Username and password at the time of setup. The credentials are stored in the MySQL database in hashed format, so as to ensure protection of user data.

Pages: The Kara system contains various web pages to provide better user experience while using the assistant. Users can access data and control their appliances through the pages. The pages are:

1) Login: The user can log on to the Kara system by opening the base URL provided while setting Kara up. The user provides their credentials (set during initial setup) which is sent to the server and matched with the database, if the credentials are valid, the user is logged in.

2) Dashboard: After successfully logging in, the dashboard loads up, the dashboard lists all the information about the energy consumption and production by the household. It includes:

- Current Level of Supply line: The current being drawn by the household
- Voltage Level of Supply line: The voltage in the household.
- Current Level of Production line: The current being produced by the solar panels, etc.
- Voltage Level of Production line: The voltage produced by the solar panels, etc.

These data are shown in a real time graph which up- dates with every change in the readings of the current or voltage. There are two tabs in the dashboard, One for Production and another for Consumption. Each tab contains two graphs. The first graph displays Current level (in Amperes) in the Y-axis with timestamp as the X-axis, the second graph presents the Voltage level (in Volts) in the Y-axis with timestamp in the X-axis. The total energy consumed and produced is also displayed under the respective tabs in the dashboard; this counter keeps track of the day to day consumption and production of energy as well as the monthly consumption and production (both in Units). All the data and graphs on these pages are dynamic and are updated in real time with the changes occurring in the measured values.

3) Appliances:

The Appliances section in the home page lists all the appliances currently connected with the Kara system, here the user can see the names of all the appliances along with their current state (ON or OFF) and a button to change the state of the appliance, i.e. to turn ON or OFF the appliance.

The page also includes an “Add New Appliance” button, which presents the user with a form where they can set up new appliances. They need

to provide the name of the appliance, the IP address of the node MCU it is connected to, and state of the device during setup, i.e. whether it is ON or OFF.

The appliance data on this page is also updated when- ever there is any change in the state of the appliances or a new device is added.

4) Change Password:

This page has a form which can be used by the user to change their set password for accessing Kara web portal, the form asks the user to enter their current password and the new password, the old password is first matched with the database, and then the password is updated.

Results

The output from the system is expected to be accurate and satisfactory. If there aren't many fluctuations during the operation, the device can measure energy consumption without any problem.

(1) Duration of Measurement: During measurement, it takes only some seconds to start giving the current, voltage and energy data.

(2) Accuracy: As mentioned earlier, all the measurements mainly depends on waveforms from the circuit (zcd and xor gate) which depends upon the supply or load and the sensors which are used in this circuit to measure current and voltage.

Conclusion

After completion of our project of building a home assistant directly focusing on the energy consumption of a household we can successfully conclude that energy consumption needs to be a more publicized issue globally. People need to start applying renewable energy sources like Solar energy or wind energy for producing electricity even on small scales.

Projects such as ours need to be undertaken to make people aware about the amount of energy that gets wasted daily. We need to take an initiative to cut down on our energy usage and wastage to conserve some amount of non-renewable resources for our future generation. People need to understand the catastrophe that is knocking at our doors in the form of exhaustion of fossil fuels like petroleum and coal. We should be aiming towards a world where all our energy requirements can be fulfilled entirely using renewable resources.

Building or upgrading to an energy efficient lifestyle requires an initial investment that is higher than the cost of a traditional living. However, there are government grants and incentives that can help to get you started and offset some of the cost. After you live in your energy efficient house for a few years, your upfront investment will pay for itself.

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